higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

GENERAL EDUCATION AND TRAINING CERTIFICATE

NQF LEVEL 1

AET LEVEL 4 SITE-BASED ASSESSMENT

LEARNING AREA : MATHEMATICS AND MATHEMATICAL SCIENCES

CODE : MMSC4

TASK : INVESTIGATION

TIME : 3 HOURS

MARKS : 50

This assessment task consists of 6 pages and an Annexure.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions in ANSWER BOOK.
2. Read ALL the questions carefully.
3. Calculators may be used.
4. Clearly show calculations, diagrams, graphs, et cetera which you have used in determining the answers,
5. Number the answers according to the numbering system used in this question paper.
6. This investigation should be done in pairs. Each student submit his/her own work.

South Africa is a water scarce country. It has an average rainfall of 550 mm, which is below the world average of 850 mm. The situation has been worsened by the drought that has hit the country and is expected to last till the summer of 2018. All schools in South Africa must have water tanks to ensure that there is a constant supply of water. Most school roofs have a large surface area and existing gutters to harvest rain water in case of emergencies. In this task you will investigate two types of water storage tanks i.e. cube and cylindrical storage.

Activity 1: Cube Tank

1.1 The cube tank is made of steel panels. All faces of the tank are covered with steel panels which are secured by rivets. The tank is then placed on a concrete platform.

[www.alibaba.com]

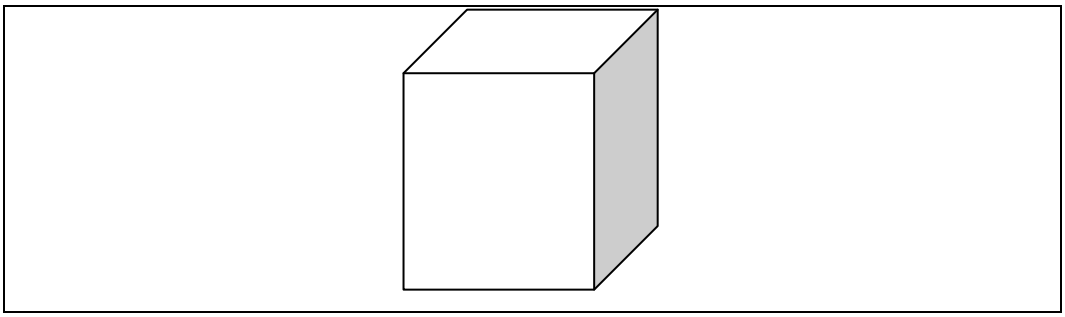
Given below is the length of ONE panel:

1.1.1 Give the mathematical name for the geometrical shape of a panel. (1)

1.1.2 Determine the breath of the tank? (2)

1.1.3 Calculate the area of the floor of the tank.
Use the formula: $Area = length \times breadth$ (2)

1.2 A tank is a 3-dimesional (3D) object which is commonly referred to as a cube.



1.2.1 Calculate the volume of the tank.
Use the formula: $Volume\ of\ a\ cube = length \times breadth \times height$ (3)

1.2.2 How many litres of water will be needed to fill the tank to its maximum capacity? (3)
Hint: $1m^3 = 1000\ 000\ ml$ and $1\ l = 1000\ ml$.

1.2.3 It is recommended that the cube tank be filled up to 99,74% of its maximum capacity. Calculate the recommended capacity of the cube tank. Round off your answer to the nearest litre. (3)

1.3 All faces of the tank are made with panels, including the floor.

1.3.1 How many panels were used to create this tank, including those underneath the tank? (2)

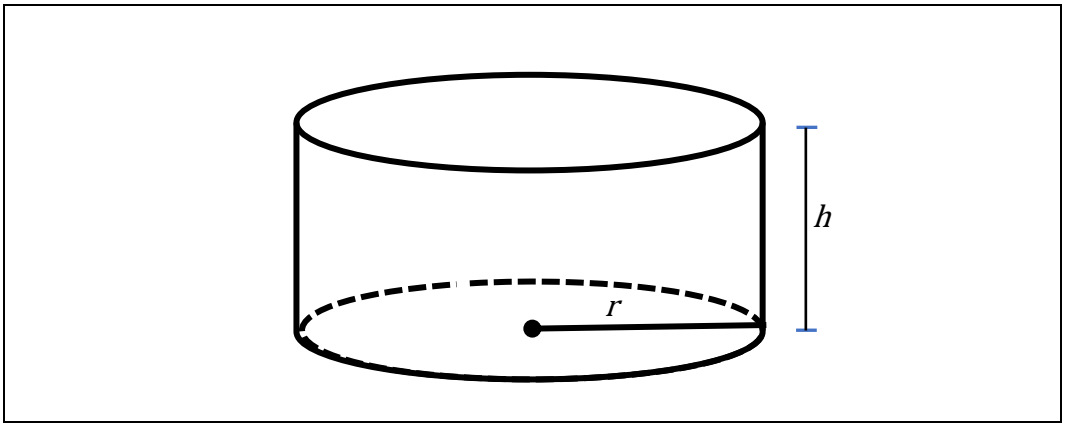
1.3.2 Calculate the total surface area of the tank that is covered by the panels. (3)
[19]

Activity 2 : Cylindrical water tank

The cylindrical tank has a recommended storage capacity of 4,9 kilolitres and is supposed to be filled up to the height of the vertical wall which is 1,75 metres high. The roof of this tank is in the shape of a cone, which can also be filled to give the maximum volume of the tank.

[www.storagetankmanufacturer.com]

2.1 The recommended capacity fills the tank up to 4,9 kl.



2.1.1 How many litres can this tank hold when filled to the recommended capacity? (1)

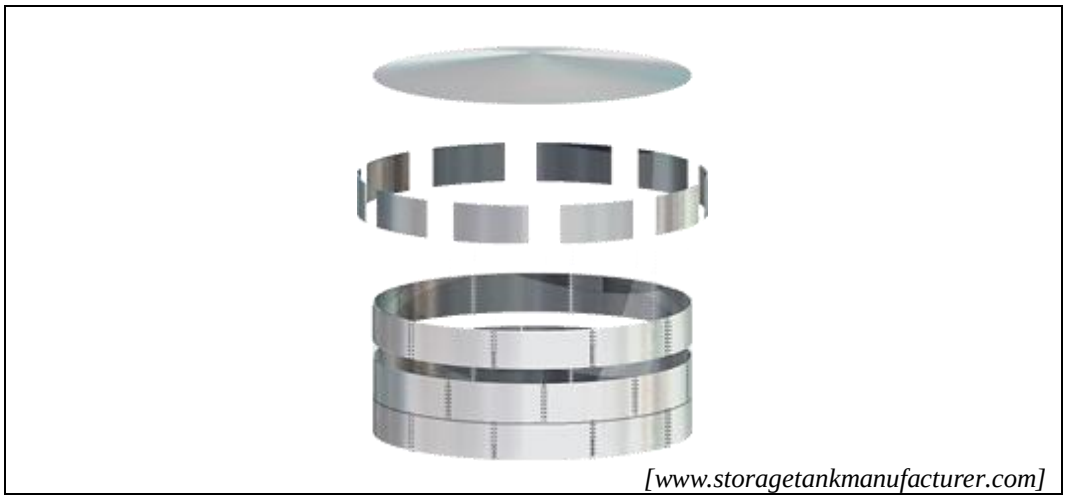
2.1.2 Calculate the volume of this tank in m^3?
Hint: $1m^3 = 1000\ l$ (2)

2.1.3 Calculate the area of the floor of the tank.
Use the formula:
$$Volume\ of\ a\ cylinder = Area\ of\ a\ circle \times height$$ (2)

2.1.4 Calculate the radius of the floor
Use the formula: Area $= \pi \times r^2$, where $\pi = 3.14$ (3)

2.1.5 Calculate the circumference of the tank.
Use the formula: circumference $= 2 \times \pi \times r$ or
Circumference $= \pi \times d$ (2)

2.2 The vertical wall of the cylindrical part of the tank is made of steel panels. The diagram below represents the panels of a similar shaped tank.



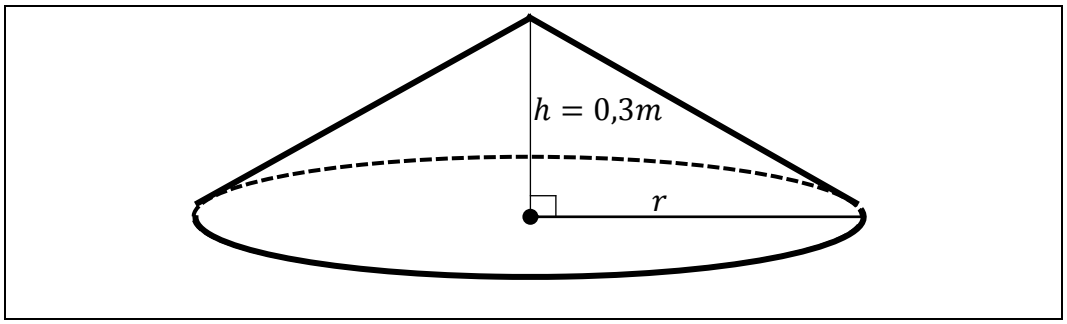
[www.storagetankmanufacturer.com]

2.2.1 Calculate the area of the vertical wall of the tank.
Use the formula: $Area = circumference \times height$ or
$Area = 2\pi r \times h$, where h is the height of the tank (2)

2.2.2 If each panel has a length of $0{,}9\ m$ and a width of $0{,}5\ m$, calculate the area of the panel.
$Area\ of\ a\ panel = length \times breadth$ (2)

2.2.3 How many panels are used to build the vertical wall of the tank? Round your answer to the nearest whole number. (2)

2.3 The roof is a cone which has a height of $0{,}3\ m$ and the base has a radius of $0{,}9\ m$.



2.3.1 Calculate the volume of the roof
$Volume = \frac{1}{3} \times \pi \times r^2 \times h$, where $h = 0{,}3\ m$ and $\pi = 3{,}14$ (2)

2.3.2 How many litres of water can the cone (roof) of the tank store? (2)

2.3.3 Calculate the total surface area of the cylindrical tank, if the area of its roof is $0{,}9\ m^2$.

Use the formula: (2)
Total Surface Area = Area of roof + Area of vertical wall + Area of floor **[22]**

Activity 3: The conclusion

3.1 The cost to construct the cube tank is $R970{,}90$ per m^2 while the cylindrical tank cost $R1199.96$ per m^2.

3.1.1 Calculate the total cost to construct each tank. Use the total surface area in ACTIVITY 1.3.2 for the cube tank and ACTIVITY 2.3 for the cylindrical tank. (4)

3.1.2 Consider the surface areas, maximum capacities and total cost of both the cube tank and the cylindrical tanks. Which tank offers the best value for money? Give a reason for your choice. (3)

3.1.3 How can people in your community save water? (2)
[9]

TOTAL: 50